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CENTRAL AMERICAN CALENDARS AND THE GREGORIAN DAY

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The day-for-day correlation of the Mayan, Aztecan, and Gregorian calendars depends upon mathematical relations and logical assumptions.

First, as regards the archaic Mayan system of counting time, seen in inscriptions on monuments, the following assumptions are regarded as established:

a. That the permutation cycle of 260 days made by combining 20 days and 13 numbers in sequence was continuously applied to days from a beginning day.

b. That the notational system by which the index number of a day was written down was also continuously applied and that the designation of a day in the permutation and in the notation was constant and determinable.

c. That the *tun* (360 days) and *katun* (7200 days) were not abstract time periods but instead were order values in the notational system and necessarily involved a context of the long count of days of the Mayas just as '06 or '19 necessarily involves a context in the long count of years that distinguishes European chronology.

d. That the Mayan *haab* was a vague year of 365 days divided into 18 long months of 20 days each and one short month of 5 days and that while the true length of the tropical year was known with tolerable accuracy to the Mayas no correction was directly applied to the *haab* count for fear of disorganizing the day count which was the common measure of all astronomical and mathematical cycles.

As regards the records and time counts used by the Mayas of northern Yucatan at the time of the Spanish conquest it is regarded as proven:

a. That an organic contact with the archaic long count was maintained through the orderly succession of *tuns* and *katuns* designated by the name of the day on which they were completed.

b. That a true contact and correlation of the U Kahlay Katunob cycle of the historical summaries in the Books of Chilan Balam and the archaic long count was affected when the initial series date at Chichen Itza was placed in the earliest occupation of this site in the historical summary. According to this correlation Katun 8 Ahau at the beginning of the historical summary coincides with the round number 9–0–0–0–0, 8 Ahau 13 Ceh, in the long count and the particular Katun 13 Ahau, completed early in the Spanish conquest of Yucatan, coincides with 12–9–0–0–0, 13 Ahau 8 Kankin.

c. That the much-discussed shift in the positions that the days could occupy in the months of the *haab* (whether real or apparent) had no effect on the continuity of day names determined by the permutation cycle and the ancient notation and that 7 Ix 1 Pop of the late Mayan statements must be regarded as equivalent to 7 Ix 2 Pop of the early Mayan statements.

d. That the "year bearer" method of designating the *haab* in northern Yucatan, while frankly at variance with the classical philosophy of counting only completed time units, nevertheless was organically tied into the ancient day count and that a year bearer 7 Ix designated a *haab* beginning with a day 7 Ix 2 Pop in the long count.

e. That the end of Katun 13 Ahau fell during the Spanish conquest of Yucatan in a year 7 Ix according to the following mathematical demonstration:

12–8–14–4–14 7 Ix 2 Pop
13– 6
12–9– 0–0 0 13 Ahau 8 Kankin

f. That the year 7 Ix corresponded to the latter part of the European year 1535 and the earlier part of 1536 on reasonable evidence fixing the correlation of several year bearers in the year-bearer cycle (52 × 365 days).

The ground having been laid in this fashion for a correlation of days the complete Mayan year given by Landa is brought into relationship with the long count as follows:

a. This year was one marked by 12 Kan as year bearer and, therefore, corresponded in the current year-bearer cycle to 1553–'54.

b. This initial day of the Landa year, namely, the day 12 Kan 1 Pop in the late Mayan nomenclature or 12 Kan 2 Pop in the ancient nomenclature, equaled 12–9–17–9–4, 12 Kan 2 Pop in the long count and it likewise equaled July 16, 1553, in the Julian Calendar and July 26, 1553, in the Gregorian calendar.

Having made this fundamental correlation it is evident that account must always be taken of the fact that the Mayan *haab* was a 365-day year while the Julian year had an average value of 365.25 days. Thus, if the first day of the year 12 Kan was July 26 in the year 1553, the first day of the year 6 Kan must have fallen on August 3 in 1521.

Among the Aztecs there was no long count of days put down in a fixed notation or at least no evidence of any such count has come down to us. There was, however, a permutation cycle of 260 days based on 20 names, that show etymological correspondence to the 20-day names of the Mayas, and 13 numbers. The historical records were mostly recorded in a year-bearer system. Structurally the Mexican year began with the month Toxcatl because this was the month that had as its initial day the particular day giving its name to the year.

The day-for-day correlation of the Aztecan calendar and the Gregorian calendar is based on the recorded position of a few days in both counts and on statements of the beginning days of the Aztecan months. These statements have constantly to be corrected as of a definite year owing to the retrogression of the 365-day Aztecan year in relation to the 365.25 day Julian year.

In the correlation as finally effected, the Aztecan year 3 Calli began ostensibly on a day 1 Calli, the first of the month Atlcaualco, but with the significant day 3 Calli as 1 Toxcatl. The day 1 Calli 1 Atlcaualco corresponded to February 12, 1521, Julian calendar, or February 22, Gregorian calendar.

A highly important fact develops when the Mayan and Aztecan calendars are brought together after each has been correlated to the Gregorian day. This fact is the practical identity of the two time counts which has never before been assumed or demonstrated. It should be sufficient to remove any doubts engendered by unavoidable adjudication of evidence where authorities are in conflict.

The Aztecan year bearers, Calli, Tochtli, Acatl, and Tecpatl are equivalent to the Mayan days Akbal, Lamat, Ben, and Eznab, that in the archaic Mayan calendar could occupy the position 1 Pop. But the Yucatan year bearers Kan, Muluc, Ix, and Cauac come one day later than these days. Therefore, the Mayan year bearers, Kan, Muluc, Ix or Cauac, should have numbers one in excess of the equivalent Aztecan year bearers. But it is clear that the Mayan year 6 Kan does not equal an Aztecan year 5 Calli, instead it equals a year 3 Calli. This discrepancy is not fundamental since the two years do not begin at equivalent positions in the tropical year. This initial day 6 Kan 1 Pop of the Mayan year 6 Kan fell on August 3, 1521, and in the Aztecan year 3 Calli found its practical equivalent in the first day of the month Tlaxochimaco that began with 5 Calli on August 1. More exactly 6 Kan equals 6 Cuetzpalin, the second day of the Aztecan month Tlaxochimaco, corresponding to August 2. We find, therefore, that the permutation cycles of the two calendars come within a day of exactly coinciding. The mathematical possibilities involved in this essential agreement would seem to assure the truthfulness of the Mayan correlation.

It is expected that this new possibility of turning Mayan and Mexican dates into the Gregorian calendar will open a new field for investigation.

Central American records on monuments and in codices have long been supposed to contain astronomical statements of eclipses, etc. Furthermore it may be remarked that by this demonstration American history is made more exact than the history of Egypt, Greece, or Rome. For instance, the dedicatory date on Stela 9 at Copan corresponds to March 31, 304 A.D., in the backward projection of our present Gregorian calendar. The earlier artistic classification of the present writer, and the general *katun* correlation of Morley, were correct within a very few years.

The data in full will appear in the *Anthropological Papers of the American Museum of Natural History.*

THE TORSIONAL MAGNETIC ENERGY ABSORPTION OF AN IRON CONDUCTOR[1]

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1. *Apparatus.*—The relations of torsion and magnetization have been studied by Wiedemann, Auerbach and many others since, chiefly in longitudinal fields. The torsion effect produced by a circular field is very small and difficult to ascertain. I, therefore, thought it of interest to make some measurements of this kind, using the displacement interferometer and achromatic fringes. The results were very definite and would easily have admitted of higher precision. The apparatus is shown in figure 1, where *AB* is a thin, low carbon steel tube, effectively 55 cm. long, having an average diameter of 0.875 cm., and walls 0.076 cm. thick.

The tube is firmly clutched below by a clamp, but free above. It carries the mirror *mm'* which is a strip of thin plate glass, silvered and slightly adjustable about a vertical and horizontal axis. The ends receive the component rays of the interferometer, so that any slight rotation of *mm'* about the vertical axis is at once registered by the displacement of fringes. Finally a strong electric current may be passed through the length of the tube, entering at *A* and leaving by the mercury cup *C*. The current must be reversible at pleasure

2. *Observations.*—The fringes are displaced (i.e., the tube receives magnetic set) immediately after closing the circuit. Closing it any number of times thereafter is ineffective to the fraction of a fringe. There is practically no temporary effect. On reversing the current, the fringes are markedly displaced in the opposite direction, again to hold the new position, however often the current is made and broken thereafter.

To obtain a temporary effect I surrounded the *AB* with a massive iron tube, about 6 inches long and 2 inches in diameter, clamped at the top *B* (bell-like) but otherwise free from it. Even now, with currents up to